What is claimed is:

1) A microfluidic device for providing a concentration gradient, comprising:

a microfluidic channel having a first and second inlet and a first outlet;

a first fluid comprising a diffusible constituent flowing through said first inlet into said channel;

a second fluid flowing through said second inlet into said channel such that said first fluid flows in parallel with said second channel in at least a portion of said channel, thereby providing a diffusion interface between said first and said second fluid and said diffusible constituent diffuses from said first fluid into said second fluid such that the concentration of diffusible species varies along the longitudinal axis of said diffusion interface.

2) The device of claim 1, wherein said second fluid comprises particles that interact with said diffusible constituent of said first fluid such that the interaction creates a measurable effect that is different for different concentrations of diffusible species.

3) The device of claim 1, further comprising:

a third fluid inlet to said channel and a third fluid also comprising diffusible constituents entering said channel through said third inlet such that said first and third fluids, surround said second fluid on two sides and diffusible constituents diffuse into said second fluid, thus diluting said second fluid such that the concentration of said second fluid is gradually decreased with distance from a section of said channel where said first and second fluids contact one another.

4) The device of claim 4, wherein said first and third fluids are introduced through said first and third inlet from a common inlet.

5) A microfluidic device for exposing particles to a concentration gradient comprising:

a first inlet and a first solution;

a second inlet and a second solution also comprising a first soluble compound;

a first channel, attached to said first and second inlets, with

said first and second solutions flowing in parallel with each other through said first channel, thereby mixing by diffusion and thus forming

a stream having a gradient of concentration along the longitudinal axis of said first channel;

and a third inlet, located downstream from said first and second inlets and a third solution flowing within said third inlet containing particulate matter such that said third solution and said stream flow in parallel in the portion of said channel located downstream from said third inlet, whereby exposing said particulate matter to a concentration gradient.

6) The device of claim 5, wherein a plurality of said microfluidic devices are located on a single chip.

7) The device of claim 6, further comprising a measurement region for measuring the difference in a response within said devices on said chip.

8) The device of claim 1, wherein the rate of flow of said first fluid and said second fluid remain constant.

9) The device of claim 1, wherein the rate of flow of said first fluid varies with respect to the rate of flow of said second fluid.

10) The device of claim 1, wherein said diffusible constituent consists of a soluble compound.

11) The device of claim 5, wherein said particulate matter comprises biological material.

12) The device of claim 11, wherein said biological matter consists of cells.

13) The device of claim 11, wherein said biological material consists of proteins.

14) The device of claim 5, further comprising sensing means for measuring a reaction between said stream and said particulate matter in said third solution.

15) The device of claim 2, wherein said particles consist of molecules such as proteins.

16) The device of claim 2, wherein said particles consist of large undissolved particles.

17) The device of claim 17, wherein said undissolved particles consist of microbeads.